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The CDC Pacific emergency health initiative: A pilot study of emergency preparedness in Oceania

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Abstract

Objective: Environmental emergencies and disasters are becoming more frequent in developing nations. Between 1992 and 1996, disasters affected an annual average of 4.5 million Oceania residents. Unfortunately, public health planners in the region and responders throughout the world have little evidence on which to base measures of emergency preparedness. Indicators of preparedness must be identified, implemented and evaluated before the effectiveness of emergency planning interventions can be measured accurately. The aim of this study was to perform an objective evaluation of emergency preparedness among five nations in Oceania.

Method: A standardized retrospective review of national-level public health and institutional-level hospital emergency operations plans from a convenience sample of five Pacific nations or territories was performed. In addition, in-country interviews, observation of operations and review of documentation were conducted. The rates of affirmative responses to 957 yes/no queries in the questionnaire were tabulated according to major emergency operational planning concepts and categories of emergency support functions.

Results: The study revealed remarkably low levels of emergency planning and preparedness among health and medical sectors of five Pacific islands.

Conclusion: These data suggest a very low level of host national capacity for development of preparedness. Further investigation is necessary to define this need throughout this region of Oceania. **See Commentary, page x.**

Key words: *disaster plan, emergency preparedness, emergency response, environmental health, global health, Oceania, Pacific basin, public health.*

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Introduction

Serious deficiencies have been reported among some Pacific island nations in regards to the quality and accessibility of health care, medical workforce training and availability, as well as health facility maintenance and management.[1] Public health absorptive capacity and thresholds for emergency response are highly dependent upon a functional health-care system.

Environmental emergencies are becoming more frequent in developing nations.[2] Between 1992 and 1996, disasters affected an annual average of 4.5 million Oceania residents.[3] This represents twice the number of those affected throughout all of the Americas during that period. The damage caused by disasters in Oceania during one 10-year period (1987–1996) was estimated to average over US$1 billion every year.[3]

Recently, the overall approach to emergencies and disasters among nations has shifted from haphazard and expensive post-disaster response to a more systematic process of risk management that also emphasizes prevention, mitigation and preparedness.[4] The challenge for public health involving emergencies and disasters is to then focus ever-limited resources towards the most cost-effective and sustainable means of risk management.

The purpose of this study was to perform an objective evaluation of emergency preparedness among five nations in Oceania.

The CDC pacific emergency health initiative

Background

At the February 2000 meeting of the Pacific Island Health Officers Association (PIHOA), the Centers for Disease Control and Prevention (CDC) proposed development of a regional strategy for assessment of emergency public health systems and subsequent development of emergency and disaster health skills in the Pacific. This proposal suggested a collaboration of governmental institutions, international agencies, Pacific nations, the Pacific Basin Medical Association and PIHOA. Centers for Disease Control and Prevention also suggested a Pacific-based pilot project for development of regional training capacity for emergency health services and public health planning. During 2000, CDC performed comprehensive assessments of the emergency public health and medical systems in a total of five Pacific jurisdictions including Palau, Samoa, American Samoa, Cook Islands, and Marshall Islands. This project is known as the CDC Pacific Emergency Health Initiative (PEHI).

Methods

Centers for Disease Control and Prevention staff performed a retrospective review of national-level public health and institutional-level hospital emergency operations plans (EOP) from a convenience sample of five Pacific nations or territories (jurisdictions 1–5). In addition to the technical review of EOP, CDC staff also performed in-country interviews, observation of operations and review of relevant planning documentation.

Interviews

Interviews and meetings were held with government and private officials, hospital and public health staff, plan stakeholders and community service organizations. These persons also included representatives from public health, public safety, public works, education and administration. Interviews were performed to evaluate organizational relationships, elaborate on planning and response issues and to validate planning assumptions.

Observation of operations

On-site visits and observation of operations were performed, for example in:

- Health-care facilities: inpatient and outpatient
- Public utilities: water, electricity, communication
- Public safety headquarters: fire and law enforcement
- National and local seats of government
- Educational institutions
- Transportation hubs: seaports, airports
- Volunteer organization headquarters
- Market and commercial retail districts
- Television and radio broadcast facilities
- Residential and commercial areas

Review of documentation

Where available, planning documents were reviewed to include the national plan, the public health sector plan and the hospital plan. Other forms of documentation reviewed included:

- Health-sector strategic plans.

Table 1. Positive response rates according to hospital emergency functions

Emergency function categories	Symbol	Nation 1	Nation 2	Nation 3	Nation 4	Nation 5	Mean Pq
Authority, command & control	$P_{Command}$	0.64	0	0.44	0	0.60	0.34
Rapid assessment	P_{Assess}	0.79	0	0.07	0	0.07	0.19
Finance	$P_{Finance}$	0	0	0	0	0	0
Administration	P_{Admin}	0.33	0	0.17	0	0.69	0.12
Communications	P_{Commo}	0.32	0	0.19	0	0.09	0.12
Health facility evacuation	P_{Evac}	0.17	0	0	0	0	0.03
Transportation	$P_{Transport}$	0.13	0	0.18	0	0	0.06
Security and traffic control	$P_{Security}$	0.25	0	0.50	0	0.25	0.20
Search & rescue and field medical response teams	$P_{S\ \&\ R}$	0	0	0.04	0	0.30	0.07
Hospital utilities & maintenance	P_{Util}	0.11	0	0.22	0	0.44	0.15
Hospital patient care	$P_{Patient}$	0	0	0.14	0	0.32	0.09
Hospital-based mortuary care	P_{Mort}	0	0	0	0	0.50	0.10
Staff training & exercises	P_{Train}	0	0	0	0	0.50	0.10
Essential emergency equipment & supplies	P_{Equip}	0.05	0	0	0	0	0.01
Medical preparedness quotient	$P_{qMedical}$	0.20	0	0.14	0	0.27	

- Country background briefs from travel and government information sources.
- United States (US) Department of Defense disaster preparedness and mitigation assessment reports.
- Literature review for country disaster history and hazards.

Questionnaire

A standardized questionnaire consisted of 957 yes/no questions was used to assess all existing EOP for presence of planning provisions related to public health and hospital preparedness. The instrument was designed to be applicable to island nations of the Pacific basin region, but also elsewhere. represents a listing of Essential emergency support functions that were assessed according to criteria established for hospital emergencies are listed (Table 1). Essential emergency support functions that were assessed according to criteria established for public health emergencies are listed (Table 2). These performance indicators were established in accordance with essential health sector functions for disaster management.[5–13]

Technical review

Centers for Disease Control and Prevention evaluators performed a technical review of each available host nation EOP. This review included evaluation of both the national-level public health EOP and the national hospital EOP, when either or both were in existence. Each jurisdiction studied had one main referral hospital. Plans were reviewed regarding the presence or absence of 957 emergency planning criteria listed by the questionnaire. These criteria were categorized according to the following main emergency function indicators as related to planning and preparedness: (i) essential elements of an emergency operations plan; (ii) hazard identification; (iii) disaster mitigation; (iv) essential emergency functions; (v) essential disaster recovery functions; (vi) general public health functions; and (vii) hospital emergency preparedness. Questions related to disaster management phases other than preparedness and response (e.g. mitigation and recovery) were limited to include those directly applicable in the preparedness or acute emergency response phases.

Calculation of the preparedness quotient

The rates of affirmative responses to yes/no queries in the questionnaire were tabulated according to emergency operational planning concepts (i.e. function/task identification; direct name and line delegations of responsibility and authority; hazard specific contingencies; operating, reporting and evaluation procedures) and for each category of emergency support function (i.e. command and control; communications; transportation; logistics; finance–administration; operations). A listing of positive response rates according to major categories of emergency management is provided (Tables 1, 2).

Table 2. Positive response rates for five Pacific nations according to public health emergency functions

Preparedness quotients	Symbol	Nation 1	Nation 2	Nation 3	Nation 4	Nation 5
Essential elements of an emergency operations plan	P_{Plan}	0	0	0.21	0	0.21
Basic plan		0	0	0.35	0	0.25
Functional annexes		0	0	0	0	0
Hazard specific annexes		0	0	0	0	0.10
Standard operating procedures		0	0	0	0	0
Plan concepts		0	0	0.50	0	0.75
Training & exercises		0	0	0.18	0	0.45
Hazard identification	$P_{HazardID}$	0	0	0	0	0.09
Disaster mitigation	$P_{Mitigate}$	0	0	0	0	0
Essential emergency functions	$P_{Response}$	0	0	0.08	0	0.19
Authority, command & control	$P_{Command}$	0	0	0	0	0.24
Rapid assessment	P_{Assess}	0	0	0	0	0.20
Finance	$P_{Finance}$	0	0	0	0	0
Administration	P_{Admin}	0	0	0	0	0.11
Communications	P_{Commo}	0	0	0.14	0	0.40
Public health facility evacuation	P_{Evac}	0	0	0	0	0
Transportation	$P_{Transport}$	0	0	0.08	0	0
Security and traffic control	$P_{Security}$	0	0	0.17	0	0
Public health facility infrastructure & maintenance	P_{Util}	0	0	0.50	0	0
Mass care & shelter	$P_{Shelter}$	0	0	0	0	0
Essential disaster recovery functions	$P_{Recovery}$	0	0	0.04	0	0
Critical incident stress management		0	0	0	0	0
Deactivation		0	0	0.25	0	0
Plan evaluation and maintenance		0	0	0.50	0	0
Damage assessment for recovery		0	0	0	0	0
Environmental health functions	$P_{EnvHllth}$	0	0	0	0	0.13
Hazardous materials management		0	0	0	0	0.38
Epidemiological surveillance		0	0	0	0	0.23
Vector control		0	0	0	0	0.07
Water & food quality		0	0	0	0	0
Public health preparedness	$P_{qPubHealth}$	0	0	0.06	0	0.10

The public health preparedness quotient ($Pq_{PubHealth}$) was computed as the mean value for seven functional preparedness categories areas related to public health preparedness. The medical preparedness quotient ($Pq_{Medical}$) was computed as the mean value for 15 functional preparedness categories related to hospital preparedness.

Results

Resultant positive response rates were computed according to host nation and emergency preparedness functional criteria categories. These results are summarized (Table 3) and presented in further detail (Tables 1, 2).

Interpretation of the public health and medical preparedness quotients

Positive response rates may be interpreted according to this arbitrary scale for emergency preparedness. These quotients may also be represented as a more simplified integer, the Preparedness Index, PI (Table 4).

In general, the study results note a remarkably low level of emergency preparedness throughout all five

Table 3. Summary of public health and medical emergency preparedness positive response rates according to host nation

Jurisdiction	$Pq_{PubHealth}$	$Pq_{Medical}$
1	0.00	0.20
2	0.00	0.00
3	0.06	0.14
4	0.00	0.00
5	0.10	0.27
Mean	0.03	0.12
Median	0.00	0.16

$Pq_{PubHealth}$, Public health preparedness quotient; $P_{qMedical}$, medical preparedness quotient.

Table 4. Interpretation of the public health and medical preparedness response according to positive response rates and preparedness index

Interpretation of preparedness	Preparedness	
	Quotient	Index
No Plan	0.00	0
Very Low	≤ 0.25	1
Low	0.26–0.50	2
Intermediate	0.51–0.75	3
High	0.76–1.00	4

Pacific jurisdictions studied. Three out of five had no public health EOP. Two out of five hospitals had no EOP, not even for fire. Those public health EOP that were in place were largely focused on mass casualty care as opposed to emergency public health functions like epidemiological surveillance, vector control, shelter, food and water quality, sanitation, and public education. This planning emphasis on mass casualty care does not appear to be consistent with the actual risk. During 1972–1996 disasters in Oceania affected an annual average of 1 008 274 persons. During this same time, disasters injured an annual average of 634 persons (0.06%) and killed an annual average of only 108 persons (0.01%).[2]

Generally, hospital EOP were limited to basic delegations of responsibility in absence of any corresponding operating procedures, management systems, or contingencies for business continuity. There is no formal accrediting process that includes essential elements of emergency planning. Four out of five (80%) of jurisdictions did not have basic equipment for disaster response. Four (80%) out of the five jurisdictions lacked training regarding the public health and medical consequences of disasters.

Potential sources of error

The relatively low sample size of this study may serve to limit the validity of broader assumptions regarding emergency preparedness throughout the Pacific region. However, the remarkably low levels of emergency preparedness reflected throughout this sample (representing approximately 20% of nations in Oceania), are suggestive of what may be a widespread problem among nations in the Pacific basin.

The selection of study jurisdictions was a convenience sample based upon CDC collaboration with two coexistent regional assessment projects. The Department of Health and Human Services Region IX Office of Pacific Affairs and the US Army Civil Affairs Brigade, Disaster Preparedness and Mitigation Assessment each provided travel funding for the study. Sample selection was therefore decided external to the study. Three of the five jurisdictions studied are members of the US-associated free-compact States (one of the three is a US territory). The effect of this US association on jurisdiction planning assumptions and development of preparedness (if any) is unknown.

The study controlled for reporting bias by using a standard set of criteria for evaluation of only written documentation of an EOP. Personal interpretations of planning contingencies varied remarkably among interviewees within the same jurisdiction. Only those plan provisions documented within an EOP were counted as affirmative responses. However, while helping to standardize interpretation, the yes/no format may also have potentiated an increase in the rate of false-negative responses. Planning provisions may have existed in an intermediate state that was not captured accurately by either a 'yes' or 'no' answer. The magnitude of the effect appears to be negligible in consideration of the remarkably low prevalence of emergency health plans among these nations.

Absence of documented public health and medical emergency planning

One of the most concerning findings of this study was the complete absence of any emergency plan among three out of the five public health sectors (60%) surveyed. All of these same jurisdictions without plans had also experienced a major national disaster event within the past decade. Emergency plans were also found to be completely absent for two of the five (40%) hospitals studied. All of these hospitals had also experienced a major national disaster event within the past

decade. All five jurisdictions had a national level plan in place. These national plans were without specific reference to public health beyond that of fundamental delegation of authority for disaster issues related to health and medical duties.

Very low emergency preparedness among public health and medical sectors

Only two out of five jurisdictions (40%) were found to have an EOP in place at the national level of public health. The positive response rates calculated for each of these plans were 0.06 and 0.10, suggesting a very low level of preparedness even among those jurisdictions with a plan in place. Three of the jurisdictions studied had EOP in place at their national hospitals. The medical preparedness quotients calculated for these three hospital plans were 0.14, 0.20 and 0.27, suggesting very-low to low levels of preparedness among all studied hospitals that had a plan.

Essential elements of a public health emergency operations plan, P_{Plan}

All five preparedness quotients for essential elements of an EOP, P_{Plan}, were less than 0.25, suggesting a very-low level of sophistication or completeness for planning in all jurisdictions studied.

These two public health plans that were available for study were comprised mostly of elements for a basic plan and did not include functional annexes, hazard-specific appendices, or Standard Operating Plan and checklists. These basic plans contained mostly an assignment of executive level responsibilities for disaster response.

Hazard identification, $P_{HazardID}$

Four out of five public health jurisdictions evaluated had no component for hazard identification, $P_{HazardID}$. The fifth plan evaluated was found to have hazard identification preparedness quotient of 0.09, again suggesting a very low level of preparedness throughout all jurisdictions studied. Hazard identification is an essential first step in developing evidence-based disaster mitigation and preparedness and priorities.

Disaster mitigation, $P_{Mitigate}$

All five public preparedness quotients for disaster mitigation, $P_{Mitigate}$, were zero. This suggests a total absence of plan-related mitigation activity throughout all jurisdictions studied. There were no contingencies to ensure that essential emergency response facilities named in the jurisdiction EOP would, in fact, be able to function after the impact of the disaster. Jurisdictions 1, 4 and 5 also reported a complete lack of access to critical public safety and medical response facilities and equipment immediately after the impact of previous the disasters. Few mitigation measures were taken to prevent or lessen the impact of future events.

Essential emergency functions

Preparedness quotients for essential emergency functions, $P_{Response}$, were less than 0.25 among all five jurisdictions studied, suggesting a very low level of preparedness. Among those two public health plans available for study, neither contained reference to the emergency functions related to finance, facility evacuation, or mass shelter. All public health plans were missing reference to more than half of 10 essential emergency functions (Table 2).

Calculation of the mean preparedness quotient for all five hospitals studied revealed a value of less than 0.10 for five (50%) of the 10 essential emergency functions evaluated. These functions included finance, evacuation, transportation, hospital inpatient care and disaster equipment/supplies. Overall, all of the plans studied revealed an inadequate definition of positions that would act in support functions, such as assessment, planning, administration or logistical operations, that would serve to assist the more highly visible line operational functions (medical care, search and rescue, sheltering etc.).

Authority, command and control

The plans assigned responsibility for a task-based approach but did not offer an incident management system by which these various activities would be coordinated. There were few plan parameters defined for an organizational structure that would also correlate with emergency management functions.

Rapid assessment

Only one out of five (20%) jurisdictional public health plans contained any reference to rapid health assessments. These needs and situation assessments are commonly necessary during and after a disaster in order to accurately guide response efforts and establish priorities for external assistance.

Finance

Plan provisions for funding, accounting, acquisition and budgeting were notably absent from all EOP studied.

Administration

Those plans reviewed did not include adequate descriptions of general policies for human and material resource management, including procurement and allocations. They did not identify many of the specific national response functions that would include staffing of employees beyond that of hospital personnel. The plans did not include the management of volunteers nor methods for tracking of resources.

Communications

Planning provisions did not integrate communications between the health and medical sectors and emergency responders such as public safety or the national emergency operations centres. Plans did not include provisions for assurance of continuity among communication linkages that were critical to plan operation.

Other logistical functions: evacuation, transportation, security/traffic control, utilities/maintenance

Those plans reviewed did not specify adequate provisions for logistical support that are commonly necessary during a disaster. These basic functions often include direction and control of transportation, equipment supply chain, resource staging, evacuations, scene and facility security, operations and maintenance in the setting of a loss in water and energy utilities at critical facilities (e.g. hospital or public health department).

Mass care and shelter

None of the five jurisdictions studied had any documented plan for mass shelter. No efforts had been made to evaluate and maintain facility suitability for the needs of mass shelter. No delegations of responsibility were documented with respect to mass care for displaced populations.

Workforce training and exercises

None of the EOP studied offered a framework for plan development, validation or maintenance. The workforce that would most likely involve emergency responders within the public health and medical systems did not have ready access to adequate training regarding key methods of disaster management. These personnel had very little or no experience with major catastrophic health events.

Equipment and supplies

There were very few material resources specifically dedicated to disaster preparedness and response (outside of those materials used in routine administration and operation of the public health and medical system). There were no stockpiles or stores earmarked for use in nation-wide or hospital emergencies.

Essential disaster recovery functions

The mean preparedness quotient for essential transitional disaster recovery functions (such as response deactivation, stress debriefing and damage assessment) for all five jurisdictions was extremely low (< 0.01). One plan made reference to provisions for deactivation or plan evaluation measures.

General public health functions

Only one out of five (20%) jurisdictions had a public health EOP that addressed common emergency public health issues related to hazardous materials, epidemiological surveillance or vector control. None of the public health EOP contained provisions for issues related to water quality and food safety.

Discussion

There are many factors besides planning that may also affect preparedness. These may include the effect of cultural, economic, social, educational, experiential, legislative and architectural/structural influences.

Cultural factors must be addressed in order to appreciate the context of disasters for that population. In one example, the actual word for 'disaster' using the local language implies a connotation of divine punishment for sins. This may have a notable effect upon the jurisdiction's approach to disaster preparedness.

Economic factors also have an obvious effect in the limitation of adequate resources that will support the labour-intensive process of plan development, validation, exercise and maintenance. Also in some situations where poverty forces people to live 'from day to day', it becomes very difficult for those at risk to plan or allocate resources for events of tomorrow that may have lesser probability. The way in which a society distributes and allocates resources may also have an effect upon relief work. For example, emergency response interventions in areas of Samoa should take into consideration the presence of strong Aiga relationships

and Matai social structure that include a mechanism for distribution of wealth (as well as implications for distribution of any disaster relief aid).

Social and religious factors also play a role in preparedness. The concepts of volunteerism, fatalism, existentialism, animism and issues related to personal savings or stockpiling all come into reference when addressing a society's preference or social tendencies for planning and preparedness.

Educational factors also play a role. People must be educated regarding the presence of hazards, the health implications of those hazards and the actual risks that they face. Effective methods for health emergency prevention, planning, response and recovery must be shared with those given the task of maintaining the public health.

The personal experience of plan stake holders and their subjective perception of risk also have an effect upon their willingness or intent to plan for future events. Unfortunately, all too often a society's interest in disaster preparedness is directly proportional to the severity and time passed since its last disaster. All of the islands studied have been relatively fortunate during recent generations in that there has been no large-scale loss of life. This lack of recent mass fatalities may result in a false sense of security within these regions at risk.

Legislative factors may also influence jurisdictional preparedness. Law-makers may assign priorities according to budgetary, administrative, political and strategic restrictions.

Finally, engineering and architectural issues also influence emergency preparedness. Societal preference for traditional building styles also has an impact upon preparedness. Traditional Pacific island dwellings such as the falé and the abaii obviously offer much differing levels of preparedness compared to reinforced concrete structures. Availability and cost influence the selection of building materials. Lack of zoning or engineering controls may also influence survivability of critical infrastructure. Any or all of these factors may also have attenuated the development of emergency preparedness in Oceania.

Conclusion

The worrying findings of this pilot study reveal a remarkably low prevalence of emergency planning and very low levels of preparedness among health and medical sectors of five Pacific islands, a region at high risk for environmental health emergencies.

The data reflect a very low level of host national capacity for development of preparedness. This region is highly dependent upon external assistance in order to maintain the public health and prevent excess suffering, morbidity and mortality. Future interventions should be guided by a more comprehensive study that would accurately characterize emergency preparedness for the entire Pacific basin. Subsequent interventions should be based upon definitive findings for the entire region of Oceania.

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